

#10/B(NE)

9/25/02

John T.

## CERTIFICATION OF FACSIMILE TRANSMISSION:

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING  
FACSIMILE TRANSMITTED TO THE USPTO ON THE DATE SHOWN  
BELOW:

Date of Transmission: September 24, 2002

Name of Person

Making Transmission: Karen Cinq-Mars

Signature: *Karen Cinq-Mars 9/24/02***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Application of : September 24, 2002

BRUCE J. CHAMBERLIN, ET AL. : Group Art No.: 2827

Serial No. 09/852,998 : Examiner: Tuan T. Dinh

Filed: May 10, 2001 : IBM Corporation  
Bldg. 300, Zip 482  
2070 Route 52  
Hopewell Junction, New York 12533

Title: LAND GRID ARRAY (LGA) PAD  
REPAIR STRUCTURE AND METHOD :

Do not enter

TJ  
9/26/02.**RESPONSE TO FINAL OFFICE ACTION****FAX COPY RECEIVED**

SEP 24 2002

TECHNOLOGY CENTER 2800

Sir:

In response to the Office Action dated July 25, 2002, the following Amendment is being submitted to place the above identified application in *prima facie* condition for allowance. Please amend the Application as follows:

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**IN THE CLAIMS:**

**Please cancel claim 21 without prejudice.**

**Please amend claims 10, 16, 20 and 22 to read as follows:**

10. (Twice Amended) A flexible, integral replacement pad/trace structure for repair or modification of a printed circuit board comprising:
  - a first end having shape and dimensions to serve as a replacement contact pad for a predetermined contact pad to be replaced on a printed circuit board;
  - a second end having shape and dimensions predetermined to connect to a desired electrical contact on a printed circuit board; and
  - a trace portion integral with and connecting said first and second ends and having shape and dimensions predetermined to interface to the circuit geometry of the printed circuit board between the predetermined replaced contact pad and predetermined electrical contact, said trace portion connected to a central region of said first end and having clearance areas between said trace portion and said first end such that said trace portion is orthogonal and concentric to said first end and wherein said integral replacement pad/trace structure comprises an electrically conductive and flexible material.
16. (Twice Amended) The replacement structure of claim 10, further comprising an inner insulating layer on at least a portion of said trace portion.

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20. (Amended) A printed circuit board repair structure comprising:

- a printed circuit board having at least one layer;
- at least one electrical contact pad on a first surface of said printed circuit board;
- at least one conductive through hole electrically connecting said at least one electrical contact pad to one of at least one electrical connection on a second surface of said printed circuit board or said at least one layer of said printed circuit board, said at least one conductive through hole centered on said at least one electrical contact pad;
- at least one replacement repair hole centered on said at least one electrical contact pad and having a diameter sufficient to sever all internal connections of said at least one conductive through hole that said at least one replacement repair hole replaces; and
- at least one flexible, integral replacement pad/trace structure having a first end replacing said at least one electrical contact pad and centered on said at least one replacement repair hole, a second end electrically connected to said at least one electrical connection, and a trace portion connecting said first and second end, said trace portion connected to a central region of said first end and having clearance areas between said trace portion and said first end such that said trace portion is orthogonal and concentric to said first end, wherein said at least one integral replacement pad/trace structure comprises an electrically conductive material and passes through at least a portion of said at least one replacement repair hole thereby providing a replacement electrical connection on said printed circuit board.

22. (Amended) The printed circuit board repair structure of claim 20 wherein said at least one replacement repair hole further comprises an insulating material surrounding the side walls of said at least one replacement repair hole forming a second smaller diameter providing electrical insulation for said at least one integral replacement pad/trace structure.

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### **REMARKS**

This application has been reviewed in light of the Final Office Action dated July 25, 2002. Claims 10 - 18, 20, 22 and 23 are now presented for examination. Claim 21 has been canceled. Claims 10, 16, 20 and 22 have been amended to more particularly point out and distinctly claim the subject matter regarded as the invention. Support for these amendments is detailed in the remarks that follow. No new matter has been added.

Claims 10 and 20 are independent.

Favorable review is respectfully requested.

#### **Claim objections:**

Claim 16 has been objected to by the Examiner for referring to "an outer insulating layer". Claim 16 has been amended to refer to "an inner insulating layer". Applicants respectfully request that the objection to claim 16 be withdrawn.

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The §102 rejection:

Claims 10 - 11 and 20 - 23 have been rejected by the Examiner under 35 U.S.C. §102(b) as being anticipated by Chartrand et al. U.S. Pat. No. 5,890,284.

Claim 10 has been amended to more particularly point out and distinctly claim the subject matter applicants regard as their invention. Specifically, claim 10 has been amended to more particularly claim that the trace portion of the replacement pad/trace structure is connected to a central region of the first end of the replacement pad/trace structure and that clearance areas between the trace portion and the first end allow the trace portion to be both orthogonal and concentric to the first end in order to effect the repair. Support for this amendment is found at least on page 8, lines 15 - 20 and figures 3b and 3d. Accordingly, no new matter has been added.

Claim 10 has been further amended to more particularly claim that the replacement pad/trace structure is comprised of a flexible material. Support for this amendment is found at least on page 9, lines 7 - 13. Accordingly, no new matter has been added.

Referring to figure 2 in the reference, Chartrand is understood to teach a rigid repair structure in which the elongated tail portion 14 is tangentially connected to the outer edge of the pad portion 12. This is in contrast to the present invention which discloses a flexible repair structure with a trace portion both orthogonal and concentric to the pad portion. Accordingly, the reference does not teach or suggest the features recited in Applicants'

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amended claim 10. Since claim 11 depends from claim 10, and since claim 10, as amended, is believed to be allowable, then claim 11 is believed to be allowable as well.

Claim 20 has been amended to more particularly point out and distinctly claim the subject matter applicants regard as their invention. Specifically, claim 20 has been amended to particularly claim that the conductive through hole is concentric with the electrical contact pad and that the repair hole is centered on the electrical contact pad. Support for this amendment is found at least on page 7, lines 9 - 11, page 11, lines 3 - 6, and figure 3d. Accordingly, no new matter has been added.

Claim 20 has been further amended to particularly claim that the trace portion of the replacement pad/trace structure is connected to a central region of the first end and that clearance areas between the trace portion and the first end allow the trace portion to be both orthogonal and concentric to the first end in order to effect the repair. Support for this amendment is found at least on page 8, lines 15 - 20 and figures 3b and 3d. Accordingly, no new matter has been added.

Claim 20 has been further amended to more particularly claim that the replacement pad/trace structure is comprised of a flexible material. Support for this amendment is found at least on page 9, lines 7 - 13. Accordingly, no new matter has been added.

Claim 20 has been further amended to particularly claim that the first end of the pad/trace structure is centered on the replacement repair hole. Support for this amendment is

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found at least on page 10, line 20 to page 11, line 2 and figure 3d. Accordingly, no new matter has been added.

As shown in figure 6 of the reference, Chartrand is understood to teach a rigid repair structure in which the elongated tail portion 14 is tangentially connected to the outer edge of the pad portion 12. The pad portion 12 is placed directly on the circuit board 38 with epoxy 67. The pad portion 12 becomes a new electrical contact location and does not replace a prior electrical contact pad as in the present invention. Further, the reference teaches that the repair trace is made at an offset distance from the replacement contact pad and not concentric with the replacement contact pad as in the present invention.

As an example of the advantages of the present invention, one following the teaching of Chartrand would be limited to the repair of a "dog-bone" or 1.27 mm pad array and would be unable to perform repairs on a "lily-pad" or 1.0 mm pad array. (See figures 2a and 2b in the present invention.) Accordingly, the reference does not teach or suggest the features recited in Applicants' amended claim 20. Since claims 22 and 23 depend from claim 20, and since claim 20, as amended, is believed to be allowable, then claims 22 and 23 are believed to be allowable as well.

Claim 21 has been canceled thereby rendering the rejection of this claim moot.

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The §103 rejection:

Claim 12 has been rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over Chartrand et al. U.S. Pat. No. 5,890,284 in view of Swiggett et al. U.S. Pat. No. 4,859,807.

Claim 10 has been amended to more particularly point out and distinctly claim the subject matter applicants regard as their invention. Specifically, claim 10 has been amended to more particularly claim that the trace portion of the replacement pad/trace structure is connected to a central region of the first end and that clearance areas between the trace portion and the first end allow the trace portion to be both orthogonal and concentric to the first end in order to effect the repair. Support for this amendment is found at least on page 8, lines 15 - 20 and figures 3b and 3d. Accordingly, no new matter has been added.

Claim 10 has been further amended to more particularly claim that the replacement pad/trace structure is comprised of a flexible material. Support for this amendment is found at least on page 9, lines 7 - 13. Accordingly, no new matter has been added.

Swiggett discloses a conductive wire 130b with an adhesive coating 140b. Swiggett does not teach or suggest the above mentioned features of the invention. Accordingly, neither Chartrand nor Swiggett, nor a combination thereof renders obvious the repair structure disclosed in Applicants' amended claim 10. Claim 12 depends from claim 10. Since claim 10 is believed to be allowable for the reasons discussed above, then claim 12 is believed to be allowable as well.

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Claims 13 - 15 have been rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over Chartrand et al. U.S. Pat. No. 5,890,284 in view of Calhoun et al. U.S. Pat. No. 4,931,598.

Calhoun discloses electrical connection tape and teaches a wire conductor may be plated with gold and nickel. Calhoun does not teach or suggest the above mentioned features of amended claim 10. Accordingly, neither Calhoun nor Chartrand, nor a combination thereof renders obvious the repair structure disclosed in Applicants' amended claim 10. Claims 13 - 15 depend, directly or indirectly, from claim 10. Since claim 10, as amended, is believed to be allowable for the reasons discussed above, then claims 13 - 15 are believed to be allowable as well.

Claims 16 - 18 have been rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over Chartrand et al. U.S. Pat. No. 5,890,284 in view of Sawada et al. U.S. Pat. No. 5,151,406.

Sawada discloses a laminated ceramic superconductor where a superconducting wire has an insulating layer. Sawada does not teach or suggest the above mentioned features of amended claim 10. Accordingly, neither Sawada nor Chartrand, nor a combination thereof renders obvious the repair structure disclosed in Applicants' amended claim 10. Claims 16 - 18 depend, directly or indirectly, from claim 10. Since claim 10, as amended, is believed to be allowable for the reasons discussed above, then claims 16 - 18 are believed to be allowable as well.

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**Summary:**

In view of all the preceding amendments and remarks, it is respectfully requested that any objections or rejections to this application be reconsidered and withdrawn. Further action with respect to the present application is earnestly solicited. If the Examiner finds this application is deficient in any respect, the Examiner is invited to contact the undersigned at the Examiner's earliest possible convenience.

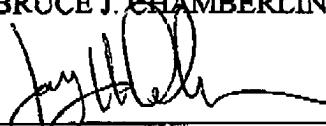
Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. This appendix is captioned "Version With Markings to Show Changes Made".

For the foregoing reasons, allowance of the claims is respectfully solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. This appendix is captioned "Version with Markings to Show Changes Made".

Respectfully submitted,  
BRUCE J. CHAMBERLIN, ET AL.

By:

  
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Attachment: Appendix - Version with Markings to Show Changes Made

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